

## REMARKS

Claims 28, 30-34, 36-48, 50-52, and 54-57 were pending and examined. By virtue of the instant Amendment and Response, claims 28, 30, 32-34, 36, 37, 40, 41, 43-46, 48, 50, 52, 55, and 57 are amended. No claims are canceled or added. Claims 1-27, 29, 35, 49, and 53 were previously canceled. Accordingly, claims 28, 30-34, 36-48, 50-52 and 54-57 are currently pending. Applicants submit no new matter is added herein.

### Claim Amendments

Without addressing the patentability of claims 28, 30, 32-34, 36, 37, 40, 41, 43-46, 48, 50, 52, 55, and 57 as previously presented in view of the cited documents, and without addressing the relevancy (if any) of the documents, and merely to streamline prosecution of the present application, clarifying amendments have been made to claims 28, 30, 32-34, 36, 37, 40, 41, 43-46, 48, 50, 52, 55, and 57. Specifically, amendments are introduced to recite “sleeve” instead of “sleeve-like member” and “wave” instead “wave-like.” Additional amendments address antecedent basis issues. Support for the amendments can be found throughout the instant application, including pp. 7-8, the Figures and the original claims.

### Claim Rejections Under 35 USC §112

Claims 28, 30-34, 36-48, 50-52 and 54-57 are rejected under 35 USC §112 (paragraph not specified) as allegedly indefinite because the claims include elements not actually disclosed, thereby rendering the scope of the claims unascertainable.

Claims 28, 30, 32-34, 36, 37, 40, 41, 43-46, 50, 52, 55, and 57 are amended to recite “sleeve” instead of “sleeve-like member.” Additionally, claim 36 is amended to recite “sleeve” instead of “sleeve-like shape.” Applicants submit the term “sleeve” is definite and clearly identified, explained and supported by the instant application. Applicants submit the rejection is overcome and respectfully request the Examiner reconsider and withdraw the same.

### Claim Rejections Under 35 USC §103

Claims 28-34, 36, 40-43, 47, 54 and 57 were rejected under 35 USC §103(a) as allegedly being unpatentable over U.S. Patent No. 5,875,223 to Nylund in view of U.S. Patent No. 5,331,679 to Hirukawa. With respect to claim 29, Applicants respectfully submit the instant rejection is moot as claim 29 was previously canceled. Concerning the remainder of the claims, Applicants respectfully disagree with the Examiner and traverse this rejection.

The Examiner states that Nylund “fails to teach that the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces.” However, the Examiner states that the lack of disclosure in Nylund is remedied by Hirukawa since, according to the Examiner, “Hirukawa teaches a sleeve-like member 12d wherein the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks 21b, which are aligned with a respective one of said abutment surfaces 13a, and with wave valleys 22 located between two adjacent ones of said abutment surfaces 13a (figure 13).” *See* Office Action, pg. 4. The Examiner states that Hirukawa at col. 9, lines 46-51 provides motivation to combine the two cited references and therefore, it would have been obvious to one of ordinary skill in the art to construct the sleeve-like member to have a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces at the upper edge of said sleeve-like member. Applicants respectfully disagree.

The disclosures of Nylund and Hirukawa were summarized in Applicants’ response dated November 12, 2008, which is incorporated herein in its entirety, and therefore not reiterated herein.

The spacer of the present invention, as recited in instantly presented claims 28 and 57, and the claims dependent therefrom, includes, *inter alia*, a spacer enclosing a number of cells, each cell being formed by a sleeve-like member having a lower edge and an upper edge; the sleeve-like member including a number of elongated abutment surfaces that project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received by the cell; the lower edge seen transversely to the longitudinal axis, having a wave-like shape with wave peaks, which are aligned with a respective

one of the abutment surfaces, and wave valleys located between two adjacent ones of the abutment surfaces and an upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of the abutment surfaces, and with wave valleys located between two adjacent ones of the abutment surfaces, each of the elongated abutment surfaces extending from a respective one of the wave peaks of the upper edge to a respective one of the wave peaks of the lower edge.

The instantly claimed invention is entirely contrary to Nylund. First, as acknowledged by the Examiner, Nylund does not disclose an upper edge having a wave-like shape. *See*, Office Action at p. 3, and Nylund at FIG. 5 and col. 3, lines 29-32. Rather, Nylund illustrates a spacer having one straight edge and one wavy edge.

The lack of disclosure in Nylund is not remedied by the disclosure of Hirukawa.

Hirukawa discloses a sleeve for a spacer for a nuclear fuel unit. *See* Hirukawa at col. 1, lines 5-7. FIG. 13 of Hirukawa appears to illustrate a sleeve with a lower edge having an irregular shape. More specifically, the lower edge of the sleeve in Hirukawa includes petal portions 21 that project down from the flat portion of the lower edge. *See* Hirukawa at col. 5 line 66 to col. 6 line 2. In addition to the petal portions 21, the lower edge also includes an intermediate flat portion 22 between the respective petal portions. The intermediate flat portions 22 allow easy spot-welding. *See* Hirukawa at col. 7, lines 42-45. The upper edge of the sleeve in FIG. 13 of Hirukawa also has an irregular wave shape created by the petal portions 21, which project up from the flat portion of the upper edge of the sleeve. Applicants note that Hirukawa does not teach how the irregular shape of the upper edge of the sleeve in FIG. 13 is configured. Only two (2) petal portions 21b are shown, whereas the rest of the upper edge appears to have a straight extension seen in a transversal direction.

It is important to note that, in contrast with the instantly claimed invention, the two “peaks” 21b of the upper edge shown in FIG. 13 of Hirukawa are not aligned with a respective “peak” at the lower edge. Instead, Hirukawa shows an upwardly-extending petal portion 21b or a flat surface on the upper edge that is aligned with downward-extending petal portion of the lower edge.

The sleeve disclosed in Hirukawa has a basically circular-cylindrical shape, rather than a wave-shape, when viewed in a longitudinal direction, *i.e.*, along the longitudinal center axis of

the sleeve. This is in contrast to the instantly claimed invention, which includes a wave-shaped sleeve, which is the result of the following feature recited in the independent claims:

... the sleeve includes a number of elongated abutment surfaces, which project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell . . . from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge.

In addition to the differences noted above, both Nylund and Hirukawa fail to disclose elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge as recited in the instant claims. As noted in the instant application at p. 5, the abutment surfaces of the instantly claimed spacers:

... ensures a long abutment line against the fuel rod extending through the sleeve-like member. The abutment line is especially long in relation to the length and weight of the sleeve-like member. By such a long abutment a small wear of the cladding tube of the fuel rod is achieved. . . In addition, by such a design a flexibility of the sleeve-like member is obtained in such a way that the latter at the abutment surfaces may move radially inwardly and outwardly and at the same time the abutment surfaces are permitted to rotate around a centre point in a radial plane.

Instead, Nylund discloses four supports that include elongated embossments facing the center of the sleeve, the supports extending along the whole length of the sleeve. *See* Nylund, col. 3, lines 17-25. While the elongated embossments extend along the whole length of the sleeve, they fail to extend from a respective one of the wave peaks of the upper edge to a respective one of the wave peaks of the lower edge, which is recited in the instant claims.

Hirukawa discloses projections (abutments) 13a, which project inward from the ferrule 12, formed at portions below the trapezoidal petal portions 21 and other projections 13b are also formed to the ferrule at portions near the other end portion to which any cutout portion is not formed. These projections 13a and 13b are formed by inwardly projecting portions of the tubular wall of the ferrule itself. *See* Hirukawa at col. 4, lines 19-26. As shown in FIGS. 10-13, the projections 13a and 13b do not extend from the upper edge to the lower edge of the sleeve much less extend from a respective one of the wave peaks of the upper edge to a respective one of the wave peaks of the lower edge, which is recited in the instant claims.

FIG. 5 of Hirukawa illustrates an embodiment having three abutment surfaces, wherein two are formed by the projections 13a of the sleeve proper and the third abutment surface is

formed by a lose spring element (loop spring 14), which is attached to the pawl piece 16 and connecting sleeves to each other in the spacer. FIG. 5 fails to show an abutment surfaces that extends from the upper edge to the lower edge of the sleeve much less extend from a respective one of the wave peaks of the upper edge to a respective one of the wave peaks of the lower edge, which is recited in the instant claims.

The projections and supports (abutments) described and illustrated in both Nylund and Hirukawa are in complete contrast to the abutment surfaces of the instant claims, since neither the supports of Nylund nor the projections of Hirukawa extend from a respective one of the wave peaks of the upper edge of the sleeve to a respective one of the wave peaks of the lower edge of the sleeve as recited in the instant claims. While the supports of Nylund do extend the length of the sleeve, the supports do not extend from a wave peak on the upper edge of the sleeve to a wave peak on the lower edge of the sleeve because Nyland does not disclose or suggest having wave peaks on both edges of the sleeve. The projections of Hirukawa simply do not extend from a lower edge to an upper edge, let alone extend from a respective one of the wave peaks of the upper edge to a respective one of the wave peaks of the lower edge as recited in the instant claims.

The Examiner asserts that a person skilled in the art would be motivated to construct a sleeve having an upper edge of Nylund with a wave shape since this would facilitate a smooth introduction of the fuel rod into the sleeve. *See* Office Action, p. 4. The Examiner refers to Hirukawa at col. 9, lines 46-51. Applicants disagree. Instead, the cited portion of Hirukawa teaches that a smooth introduction can be achieved by an outwardly twisted structure of the trapezoidal petal portions, *i.e.* the “peaks” 21b, formed at the downstream side end, *i.e.*, the upper edge. It can be seen in FIGS. 12 and 13 that the peaks 21b are twisted. In case the person skilled in the art would be motivated to modify the sleeve of Nylund with that of Hirukawa, which they would not, and provide wave peaks on the upper edge for facilitating introduction of the fuel rod, then such peaks would be twisted. Applicants submit a consequence of such twisting is that the abutment along the whole length would not be ensured. Furthermore,

Contrary to the Examiner’s assertion, one of ordinary skill in the art would not combine the two references to obtain the instantly claimed invention since Nylund seeks to solve the problem of wear on fuel rods caused by foreign matter adhering to the upstream edge of the

spacer while Hirukawa seeks to provide a fuel spacer capable of achieving a reduced pressure loss of the fuel spacer and improving the limit power output of the fuel assembly. *See* Nyland at col. 1, lines 56-58 and Hirukawa at col. 1 line 65 to col. 2, line 2.

Nevertheless, even if one were to combine the two references, one of ordinary skill in the art would not be motivated to make the sleeve-like member recited in the instant claims since the combination of the references does not disclose or suggest a spacer that includes all of the recited elements. Applicants submit the Examiner is employing an impermissible hindsight analysis in the instant rejection since the only motivation to combine the two references is the instant application.

Accordingly, Applicants submit the instant rejection as applied to independent claims 28 and 57, and the claims dependent therefrom, is overcome and respectfully request the Examiner reconsider and withdraw the instant rejection.

Claims 37-39 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa as applied to claim 1, and further in view of U.S. Patent No. 6,901,128 to Mori et al. Applicants respectfully disagree and traverse this rejection.

Nylund and Hirukawa are discussed above. Mori et al. relates to a fuel assembly in a pressurized water reactor, and in particular, to a foreign matter filter serving as a protection means against foreign matter for preventing intrusion of foreign matter into a fuel effective portion in a coolant. *See* col. 1, lines 9-13.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 37-39 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Mori et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 48 and 51 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund, Hirukawa and Mori as applied to claim 37, and further in view of U.S. Patent No. 5,272,741 to Masuhara et al. Applicants respectfully disagree and traverse the instant rejection.

Nylund, Hirukawa and Mori et al. are discussed in detail above. Masuhara et al. relates to a nuclear fuel assembly and more particularly to a nuclear fuel assembly for a boiling water reactor having space structure improved on heat transfer from fuel rods to the coolant. *See* col. 1, lines 6-9.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 48 and 51 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Neither Mori et al. nor Masuhara et al., change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 44 -46 are rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of U.S. Patent No. 4,800,061 to Shallenberger et al. Applicants respectfully disagree and traverse the instant rejection. Applicants respectfully disagree and traverse this rejection.

Nylund and Hirukawa are discussed in detail above. Shallenberger et al. discloses an apparatus and method for facilitating a scratchless insertion of a fuel rod into cellular grids of a nuclear fuel assembly. *See* Abstract.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 44 -46 depend directly from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Shallenberger et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 50 and 52 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of Masuhara et al. Applicants respectfully disagree and traverse this rejection.

Nylund, Hirukawa and Masuhara et al. are discussed above.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 50 and 52 indirectly depend from claim 28 and, as

explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Masuhara et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 55 and 56 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of U.S. Patent No. 5,778,035 to Nylund (referred to hereinafter as “Nylund 2”).

Nylund and Hirukawa are discussed above. Nylund 2 relates to a method for equalizing the cooling between less loaded and more loaded sub-regions of a fuel assembly or between fuel assemblies in a light-water nuclear reactor. The equalization of the cooling is achieved by mixing a coolant flow within a mixing cross section comprising four orthogonally arranged sub-regions which may have considerably different power levels because of different degrees of burnup or the effect from the surroundings. *See* col. 1, lines 5-13.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 55 and 56 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Nylund 2 does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Applicants believe the foregoing amendments and remarks are fully responsive to the Office Action and that the claims as now presented herein are allowable. An early action to that effect is earnestly solicited. If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants submit herewith payment of \$130.00 for a one-month extension of time for this Amendment and Response. Applicants believe no other fees are due with this submission; however, Deposit Account No. 503342 may be charged if any other fees are incurred.

Respectfully submitted,

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